



Forest Health Protection Pacific Southwest Region



Date: March 25, 2013

File Code: 3420

To: District Ranger, Eagle Lake RD, Lassen National Forest

Subject: Suspected Hazard Tree, Aspen Grove Recreation Area (FHP Report #NE13-4)

On March 14, 2014, Rick Crowther, Small Sales Officer requested a written evaluation for a fading Jeffrey pine tree (Figure 1) we suspect has decayed roots which make it unsafe. The tree



Figure 1. Jeffrey pine exhibiting classic root disease symptoms: transparent crown, tufts of needles at the tips of branches and dead branches in the lower crown. (Taken January 2012)

in question is located in the parking area at Aspen Grove recreation area (SE¼ Sec. 7 T31N, R11E, Mt. Diablo Meridian; Latitude 40.556382; Longitude -120.775110). It is 95 feet from a 24 inch DBH Jeffrey pine tree that blew down late in 2011 revealing extensively decayed roots (Figure 2) which tested positive for DNA of the fungus *Heterobasidion* spp; *H. irregulare* (formerly known as "Pine type" *H. annosum* or *Fomes annosus*) is the species that infects pines.

The fading Jeffrey pine in Figure 1 is 93 feet tall with a 36.8 inch DBH. It is growing on a 20x50 foot patch of soil surrounded by an asphalt-surfaced parking lot. It is likely that this tree's roots were damaged by



Figure 2. Decayed roots of 24" DBH Jeffrey pine which blew down in 2011, 95 feet from tree in Figure 1. (Taken January 2012)

vehicles and heavy equipment before and during construction of the asphalt parking lot. It is possible that it became infected with *H. irregulare* via root-to-root contact with the 2011 blow-down tree (Figure 2). The tree in Figure 1 shows classic root disease symptoms: 1) slowly declining and thin crown (transparent foliage); 2) shortened needles with "lion's-tail" clumping of the needles at branch tips; 3) branches dying in the lower crown; and 4) foliage slowly dying and disappearing from the interior of the crown.

Lat 40.55584 and Lon -120.77577

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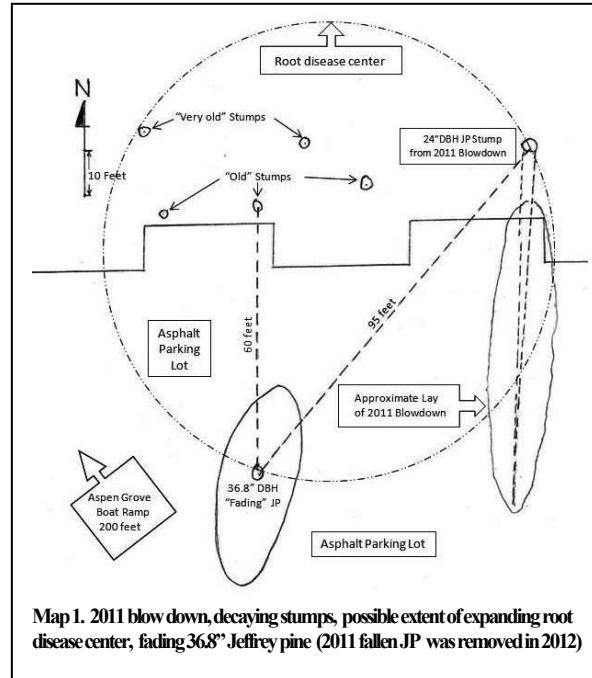
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Within about 80 feet of the 2011 blow down Jeffrey pine are three “old” and two “very old” decaying pine stumps; one stump is 60 feet from the fading Jeffrey pine (Map1; Figures 3 and 4). The decay pattern in this stump is typical of that caused by *H. irregulare*. The small pockets of decay in the sound wood show evidence of delaminating growth rings where the early wood decayed faster than the late wood. Also, when dissecting the stump, the decay was a ‘white rot’ like that caused



Figure 3. Old decaying pine stump (lower right corner) 60 feet from fading 36.8 inch DBH Jeffrey pine



Map 1. 2011 blow down, decaying stumps, possible extent of expanding root disease center, fading 36.8\"/>



Figure 4. Old decaying pine stump (Figure 3) showing decay typical of that resulting from *H. irregulare* infection.

by *Heterobasidion*. The 36.8 inch DBH fading Jeffrey pine (Figure 1) may have contracted root disease from this, the 2011 blow down tree, or another infected stump with which it had root contact; possibly the decaying stump 60 feet away.

In December 2012, wood was drilled from near the base of the 36.8\"/>

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center, but it has not yet reached the base of the 36.8" fading Jeffrey pine at the points sampled on the bole, about 4" above ground. When the fungus reaches this point in either a Jeffrey or ponderosa pine, the tree usually dies because the fungus girdles the stem.

Since most or all of a root decay fungus resides below the ground, it is unlikely that it will ever be detected before the tree blows over. With current technology, it is impossible to know how much of a tree's roots are weakened by root disease. Finding the decay would require digging up and testing a significant number of roots; thereby weakening or killing the tree.

The 2011 Jeffrey pine blow down had below ground decay in over 75% of its roots (Figure 2), and yet its crown appeared healthy. The crown of the 36.8" DBH fading Jeffrey pine pictured in Figures 1 and 3 does not look healthy. Its proximity to the known root disease center, in addition to having root disease symptoms, make 'root disease' a safe diagnosis. Regardless of whether-or-not the tree is infected with *H. irregulare*, whatever is causing its poor needle retention is weakening the tree and shortening its longevity. This tree could live ten more years or it could be uprooted by the next violent wind storm; it is impossible to know. Carefully falling this tree now would avoid potential injury or property damage and allow the healthy-looking Jeffrey pine regeneration growing under it to grow faster and reach maturity sooner; provided the regeneration does not also become infected.



Figure 5. Thinning crowns of the 36.8" fading JP (right) and several more JP just north of the "very old" decaying stumps (center).

It is important to note that three or more Jeffrey pine trees growing just north of the "very old stumps" shown on the map appear to also be infected with *H. irregulare*. The crowns of these trees, pictured in Figure 5, are becoming thin and transparent, one symptom of root disease. These trees are growing close enough to the decaying stumps to have acquired the disease through root contacts. These trees should be monitored to detect further loss of foliage and levels of decline which would warrant their removal.

Eagle Lake Ranger District is to be commended on its monitoring and mitigating the ongoing *Heterobasidion* root disease outbreaks in and around the recreation areas in the Jeffrey pine forests on the south shores of Eagle Lake. In addition, the District has been diligent in treating freshly cut conifer stumps with borate fungicides, known to prevent stump and root infections. The best control of *Heterobasidion* root disease is preventative stump treatment. Once the *Heterobasidion* fungus is established in roots, control can: 1) be very costly (removing all infected stumps and roots); or 2) take more than a quarter century (time required for the infected stumps and roots to completely decompose following the harvesting of all host plants and trees).

For more information on *Heterobasidion* root disease, see the attached. If you have any questions regarding this report and/or need additional information please contact Bill Woodruff at 530-252-6680.

/s/ Bill Woodruff
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Plant Pathologist

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NE CA Shared Services Area

Heterobasidion Root Disease

Heterobasidion spp. is a fungus that attacks a wide variety of woody plants worldwide. All western conifer species are hosts. Madrone (*Arbutus menziesii*) and a few brush species (*Arctostaphylos spp.* and *Artemisia tridentata*) are occasional hosts. Most hardwoods are apparently not infected.

Heterobasidion root disease has been reported in all National Forests in California with incidence particularly high in true fir in northern California, in the eastside pine and in southern California recreation areas.

Heterobasidion root disease is one of the most important conifer diseases in Region 5. Current estimates are that the disease infests about 2 million acres of commercial forestland in California, resulting in an annual volume loss of 19 million cubic feet. Other impacts of the disease include: loss of tree vigor, increased susceptibility to attack by bark beetles, tree death, loss of site productivity, depletion of vegetative cover and increased probability of tree failure and hazard.

During periods favorable to the fungus, fruiting bodies (conks) form in decayed stumps, under the bark of dead trees or occasionally under the duff at the base of infected trees. New infection centers are initiated when airborne spores produced by the conks land and grow on freshly cut stump surfaces. In true fir spores also infect naturally-occurring and mechanical wounds. From infected stump surfaces the fungus grows into and through the roots, via root-to-root contact, to adjacent live host trees; resulting in the formation of expanding disease centers. A disease center can continue growing, host tree to host tree, until it reaches a barrier; such as an opening in the stand or non-host vegetation.

In pines, the fungus grows through root cambial tissue to the root crown where it girdles and kills the tree. In true fir and other non-resinous species, the fungus sometimes kills small trees, but more frequently is confined to the heartwood and inner sapwood of the larger roots; sometimes infecting the heartwood of the lower trunk. In all conifers, the fungus causes chronic decay and growth loss which predisposes infected trees to beetle attack and subsequent mortality.

Heterobasidion root disease in western North America is caused by two species:

Heterobasidion occidentale (also called the 'S' type) and *H. irregulare* (also called the 'P' type). These two species of *Heterobasidion* have major differences in host specificity. *H. irregulare* ('Pine' type) is pathogenic on most pine species (but primarily on ponderosa and Jeffrey, sugar, lodgepole, pinyon and Coulter pines), incense cedar, western juniper, madrone and a few species of brush. *H. occidentale* ('Spruce' type) is pathogenic on true fir, Douglas fir, hemlock fir, spruce and giant sequoia. This host specificity is not apparent in isolates from stumps; with *H. occidentale* being recovered from both pine and true fir stumps. These data suggest that infection of host trees is specific, but saprophytic colonization of stumps is not. The fungus may survive in infected roots or stumps for more than a quarter century. Young conifers established near infected stumps often die shortly after their roots grow in contact with infected roots.

The best control for *Heterobasidion* root disease is prevention; i.e. treating freshly cut conifer stumps with a borate fungicide. The two fungicides registered for this purpose are SPORAX® (granular) and CelluTreat® (liquid). Once in the roots, *Heterobasidion sp.* can persist more than 25 years or until the roots decompose. As long as sound and wet wood, free of other microbes, is available, *Heterobasidion sp.* can survive. Therefore, the two primary controls for infected root systems are: 1) removing all host plants from the disease center for a quarter century, or until almost 100% of the roots have decomposed; or 2) removing all of the infected stumps and roots. The former may result in loss of site productivity and/or require managing only non-host trees on the site.

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The latter is usually cost-prohibitive, except in nurseries, seed orchards, administrative sites, recreation areas or high-value sites.